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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/531,864

04/18/2005

William Charles Maskell

330-024

4084

7590  
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02/17/2009

EXAMINER

DINH, BACH T

ART UNIT

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1795

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PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/531,864	<b>Applicant(s)</b> MASKELL ET AL.	
	<b>Examiner</b> BACH T. DINH	<b>Art Unit</b> 1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 18 April 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 43-67 is/are pending in the application.
- 4a) Of the above claim(s) 65-67 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 43-64 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☒ Claim(s) 43-67 are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
- ☒ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)            | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date. _____                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>04/18/2005; 02/10/2006</u> .                                  | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED ACTION**

### ***Election/Restrictions***

1. Restriction is required under 35 U.S.C. 121 and 372.

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1.

In accordance with 37 CFR 1.499, applicant is required, in reply to this action, to elect a single invention to which the claims must be restricted.

Group I, claim(s) 43-64, drawn to a method of forming a diffusion hole and a sensor.

Group II, claim(s) 65-67, drawn to a method of making a sensor.

2. The basis for holding lack of unity between group I and group II is as follows: the technical feature which is common to both groups such as a sensor with at least one heating element is taught by Sakurai et al. (US 4,574,627). Specifically, Sakurai discloses a sensor with heating element (figure 2). Therefore, since the limitation of group 1 and 2 fail to define a contribution over US 4,574,627 they fail to constitute a special technical feature and hence there is lack of unity between the recited claims.

3. During a telephone conversation with Anthony Barkume on 02/03/2009 a provisional election was made without traverse to prosecute the invention of group 1, claims 43-64.

Affirmation of this election must be made by applicant in replying to this Office action. Claims 65-67 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

### ***Summary***

4. This is the initial office action based on the application filed on 04/18/2005.
5. Claims 43-67 are pending and have been fully considered.

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6. Claims 65-67 are withdrawn from further consideration by the examiner as being drawn to a non-elected invention.

***Priority***

7. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

***Claim Rejections - 35 USC § 102***

8. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

9. Claims 43-52 are rejected under 35 U.S.C. 102(b) as being anticipated by Tuchinskiy (US 5,774,779) with evidence provided by Vaidyanathan et al. (US 7,360,309) and Keefer et al. (US 4,587,224).

Addressing claims 43 and 47-52, Tuchinskiy discloses a method for forming a diffusion hole in a fired ceramic (6:24-65) which method comprises:

i. Forming a green ceramic structure from an intimate mixture of a powder of the ceramic and a binder (10:18-25, zirconia powder stabilized with yttria mixed with binder), which structure incorporates at least one organic fibre or other organic element (10:25-28, filler-binder core material, the filler is made of organic material, 6:31-37) passing from one side of the ceramic structure to the other in a straight or non-straight

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path (figures 1 and 4, the inner core 13 comprising the organic filler passes from one side of the ceramic outer shell 12 to the other in a straight or non-straight path); and

ii. Firing the green ceramic structure at an elevated temperature to cure the ceramic and destroy the binder and the organic fibre or other organic element (10:43-45, the rod structures are heat treated at 1500°C; 6:61-65, binder is destroyed at 150-350 °C and the organic filler is destroyed at 300-500 °C).

Addressing claim 44, Tuchinskiy discloses the binder comprises polymer like ethylene vinyl acetate and ethylene ethyl acrylate (6:26-29), which are water-soluble polymer binder as shown with the evidence provided by Vaidyanathan (7:33-36).

Addressing claim 45, Tuchinskiy discloses the channel with diameter of 10-100 microns (6:46-50).

Addressing claim 53, Tuchinskiy discloses the ceramic material is sintered at 1500 °C (10:43-45), which will form tetragonal or cubic crystalline of zirconia as shown with the evidence provided by Keefer (Abstract, tetragonal phase of zirconia is obtained at a temperature from 800-1200 °C).

10. Claim 46 is rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Tuchinskiy (US 5,774,779).

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Addressing claim 46, Tuchinskiy discloses the channel with diameter of 10-100 microns (6:46-50), with reads on the claimed range due to the overlapping number, and the step can be repeated to get the desired diameter for the fibers.

In the alternative, one with ordinary would have found it obvious to modify the diameter of the fiber of Tuchinskiy because doing so is a matter of engineering choice to get the fiber with the desired diameter (6:34-51). Therefore, one with ordinary skill would have arrived at the claimed range when perform routine experimentation to obtain the fiber with the desired diameter.

11. Claims 54-55 and 57 are rejected under 35 U.S.C. 102(b) as being anticipated by Sakurai et al. (US 4,574,627).

Addressing claims 54-55, Sakurai discloses a sensor which comprises a hollow cylinder (figure 5, hollow cylinder 1) with end (layer 3b) and intermediate (layer 3a) caps enclosing at least two internal volume (an internal volume between layers 3a and 3b and a second internal volume on the electrode 5a side) the cylinder is made of ceramic material (3:54-55) with a diffusion hole (diffusion hole 2), one end of the cylinder being a sensor element comprising an oxygen-ion-conducting disc (layer 3b is a disc for it is a circular layer within the cylindrical body 1) which has a porous electrode positioned on each surface (2:56-58, the porous electrodes 5b and 4b are positioned on each surface of the solid electrolyte layer 3b), there being an electrical heating element (the heater 10) able to heat the oxygen-ion-conducting disc (4:11-21).

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The recited limitation "...formed of a ceramic with at least one diffusion hole formed in its structure by the method of claim 1..." is drawn to process limitation, even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production, MPEP 2113.

Addressing claim 57, Sakurai discloses the electrodes are made of platinum material (2:56-58).

### ***Claim Rejections - 35 USC § 103***

12. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

13. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

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14. Claims 54, 56-59 and 62-64 are rejected under 35 U.S.C. 103(a) as being unpatentable over Maskell et al. (Detection of Water Vapour or Carbon Dioxide Using a Zirconia Pump-gauge Sensor, Sensors and Actuators B, 57 (1999) 99-107) in view of Flais et al. (US 3,871,981).

Addressing claims 54, 56 and 62, Maskell discloses a sensor which comprises a hollow cylinder (figure 1, page 100, column 2 first paragraph, yttria stabilized zirconia cylindrical body) with end caps enclosing an internal volume (internal cavity in figure 1), one end of the cylinder being a sensor element comprising a disc of oxygen-ion-conducting ceramic having a porous electrode positioned at least on its internal surface (stabilized zirconia solid electrolyte layers of the pump cell and gauge cell sandwiched between their respective electrodes in figure 1), the cylindrical body has a diffusion hole (figure 1).

The recited limitation "...formed of a ceramic with at least one diffusion hole formed in its structure by the method of claim 1..." is drawn to process limitation, even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production, MPEP 2113.

Maskell is silent regarding an electrical heating element able to heat the disc of oxygen-ion-conducting ceramic.

Flais discloses an oxygen sensor; wherein, the zirconia solid electrolyte layer 16 of the sensor element is sandwiched between the heating elements 41 and 43 that are connected in parallel (figure 3, 5:30-42).



Maskell and Flais are analogous arts for they disclose oxygen sensors. At the time of the invention, one with ordinary skill in the art would have found it obvious to modify the gas sensor of Maskell with the heating elements of Flais because the heating elements would allow quick activation of the sensor element and measure the average temperature when the sensor element is subjected to a significant temperature gradient (Flais, 5:22-54), thereby providing accurate temperature control for detecting gas in high velocity atmosphere with fluctuating temperature (Flais, 2:13-23 and 2:55-68).

Addressing claims 57-58, Maskell discloses the electrodes are made of platinum with zirconia cermet (page 100, column 2 first paragraph).

Addressing claim 59, Flais discloses the heating elements 41 and 43 are adjacent to the sensor element 16 (figure 3) and the heating elements are made of platinum that are connected to the heater control 48 (5:30-36).

Addressing claim 63, Maskell discloses the pump current stays constant when the pump voltage is between 0.5 and 1 V (figure 3a); therefore, a constant can be passed through the ceramic disc via the porous electrodes. Furthermore, in figure 3b, Maskell discloses the gauge EMF or voltage is monitored.

Addressing claim 64, Maskell discloses the voltage is measured between the electrodes (page 100, column 1 paragraph 3, and figure 3b). Maskell further discloses the

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electromotive force is measured according to the Nernst equation in column 1 of page 100.

Maskell is silent regarding the electrodes on the ceramic disc are on open-circuit.

Flais discloses the sensor 10 measures the open circuit voltage output given by the Nernst equation (4:21-37) identical to that disclosed by Maskell. Therefore, during measuring the electromotive force, the electrodes of Maskell are on open-circuit.

In the alternative, at the time of the invention, one with ordinary skill in the art would have found it obvious to modify the gas sensor of Maskell by configuring the electrodes on the ceramic disc on open-circuit because doing so would allow one to measure the electromotive force between the electrodes (Flais, 4:21-37). Furthermore, one would have expected success when using the known technique of configuring the electrodes of on open-circuit as disclosed by Flais to the known gas sensor of Maskell because the open-circuit electrodes would still be able to measure the electromotive force generated due to the difference in partial pressure. Rationale D, KSR, MPEP 2141.

15. Claims 60-61 are rejected under 35 U.S.C. 103(a) as being unpatentable over Maskell et al. (Detection of Water Vapour or Carbon Dioxide Using a Zirconia Pump-gauge Sensor, Sensors and Actuators B, 57 (1999) 99-107) in view of Flais et al. (US 3,871,981) as applied to claims 54, 56-59 and 62-64 above, and further in view of Miyata et al. (US 6,214,207).

Addressing claims 60-61, Flais discloses the heating elements 41 and 43 sandwich the sensor element 16 (figure 3) and Kaowool insulation, which comprises alumina, is used for insulating the heater (figure 5, 6:10-12).

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Maskell discloses the sensor is cylindrical with the sensing elements in disc form (figure 1).

Maskell and Flais are silent regarding the heating element is a circular or square alumina disc with metal film.

Miyata discloses a gas sensor comprising heater elements 12 and 14 that are made of alumina substrate with platinum heater wires (figure 2, 14:59-67). Furthermore, the heating elements of Miyata are shaped to match the structure of the sensing elements (figure 2).

At the time of the invention, one with ordinary skill in the art would have found it obvious to modify the heater elements of Maskell and Flais with the alumina heater substrates of Miyata because the alumina heater substrate provides insulation between the heating elements and the sensor elements (Miyata, figure 2). Furthermore, one would have found it obvious to modify the heating elements as circular alumina disc because doing so would allow the heating elements to match the circular disc shape of the sensing element and allow the heating elements to fit within the cylindrical body of the gas sensor disclosed by Maskell (figure 1).

The recited limitation "...printed..." is drawn to process limitation, even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production, MPEP 2113.

***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to BACH T. DINH whose telephone number is (571)270-5118. The examiner can normally be reached on Monday-Friday EST 7:00 A.M-3:30 P.M.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam X. Nguyen can be reached on (571)272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

BD  
02/13/2009

/Kaj K Olsen/  
Primary Examiner, Art Unit 1795